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SAFETY OF PRECAST REINFORCED CONCRETE
AND PRESTRESSED STRUCTURAL MEMBERS BY THE SECOND LIMIT
STATE (SERVICEABILITY LIMIT STATE)

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Safety of Precast and Prestressed Reinforced
Concrete Structural Members by the Second Limit
State (Serviceability Limit State)

The paper concerns the results of the study of the safety of reinforced concrete and prestressed structural members with respect to their crack resistance and stiffness. The study of safety of stiffness and crack resistance of reinforced and prestressed concrete of these structural members was carried out by the research institutes TSNIIPromzdaniy and NIIZHB. The analysis of the strength safety is based on the results of the tests of 416 prestressed laboratory samples, 2183 prestressed and 1213 reinforced concrete commercial structural members. The stiffness and crack resistance of the structural members were estimated under a service load.

It was found that the basic source of increased safety of reinforced and prestressed structural members by crack resistance was a high safety level of the design tension strength of concrete. Recommendations were presented on the crack resistance design taking into account an increased safety of structural members with a developed tension zone by correcting the characteristics of the design tension strength of concrete.

The strength safety analysis was made comparing the USSR and USA building codes.

The review is intended for engineers of design and research institutes and construction companies.

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Table 6. Test results of concrete strength by the laboratories of USA and Great Britain. Statistical characteristics of compressive, flexural and axial tension strength.

Characteristic of samplings of test results of compressive, flexural and axial tension strength of concrete	Volume of sampling	Statistical characteristics of concrete strength (psi)						Coefficient of cor- relation between compressive and flexural strength of concrete
		Compression			Tension			
		Mean	Standard deviation	Coeffi- cient of variation	Mean	Standard deviation	Coeffici- ent of variation	
Cylindric compressive strength f_c and modulus of rupture f_r	3650	4437	1687.5	0.383	619	164.9	0.266	0.831
Cylindrical compressive strength f_c and axial tension strength f_t	759	3473	1403.9	0.408	285	132.5	0.465	0.864
Cylindrical compressive strength f_c and splitting ten- sion strength f_{split}	466	4034	1472	0.365	415	125.3	0.302	0.882
Cubic compressive strength f_{cu} and modulus of rupture f_r	489	5939	2550.3	0.429	623	211.9	0.34	0.82
Cubic compressive strength f_{cu} and axial tension strength f_t	210	5116	2175	0.425	402	140.7	0.349	0.796
Cubic compressive strength f_{cu} and splitting tension strength f_{split}	371	4654	1925.9	0.414	316	116.9	0.414	0.908
Modified cubic strength f_{cu}^{mod} and modulus of rupture f_r	1107	4837	2105.6	0.435	584	179.8	0.308	0.865

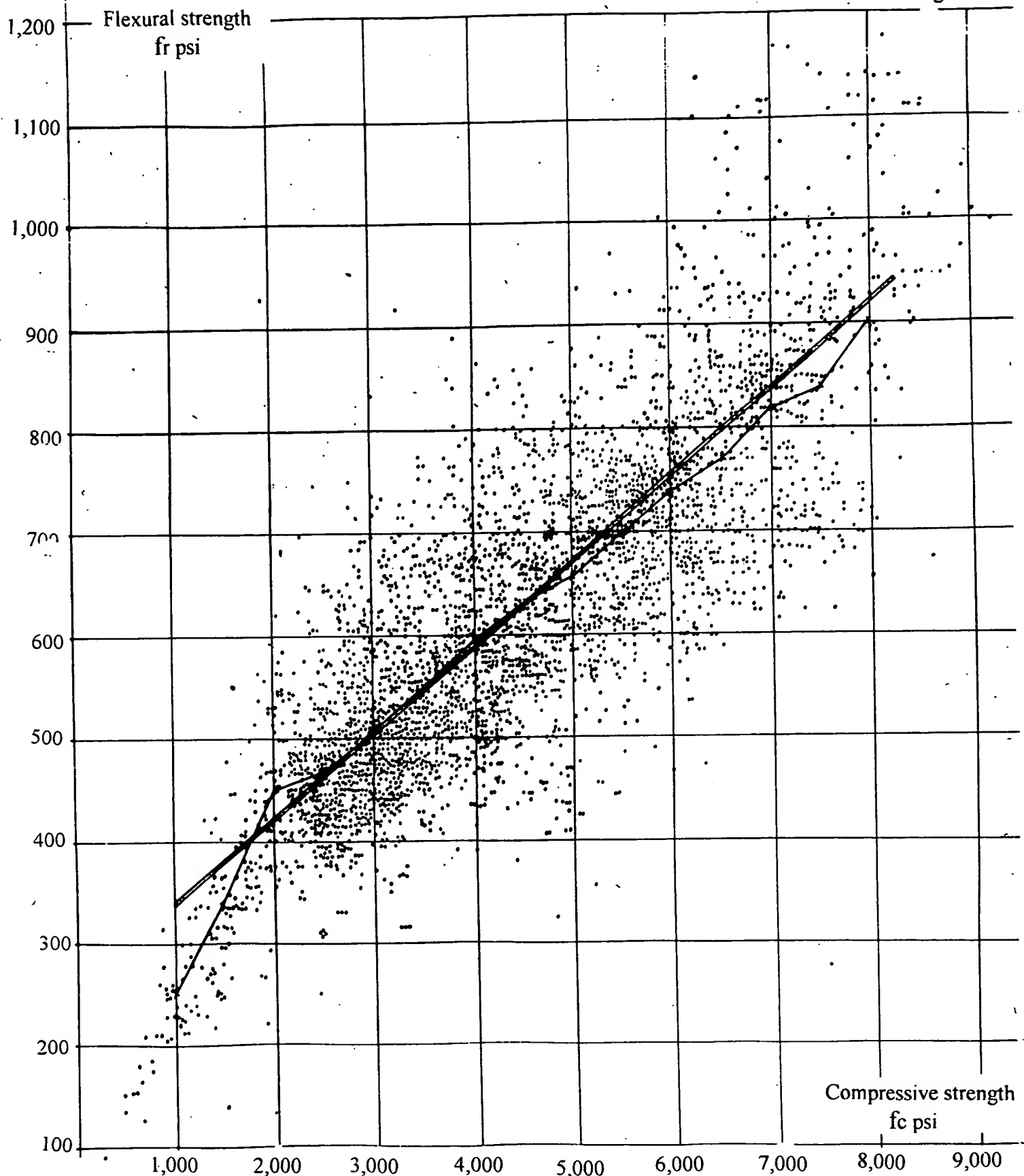


Fig.8 The change of flexural strength of concrete depending on the compressive strength of this concrete.

— The empirical line of regression
 == The theoretical line of linear regression

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